zero and as the vapor "steaming" off Lake Erie was mixed by turbulence and adiabatic cooling, great cumulus and strato-cumulus clouds developed and extended to great heights. Occasional outbreaks of thunder were reported. The entire process resulted from great difference between the temperature of the Lake surface and the cold air blowing southeastward over it. The thunder, snow and the ice-formation conditions resulting are repeated each time cold air passes over the relatively warm lake surface, and maintains a temperature below freezing. What is normally the clearing side of the retreating LOWS thus becomes the danger zone for ice in the vicinity of the Great Lakes. Apparently the greater the horizontal temperature gradient to the north of the Lakes and the lower the dew point in that section the greater will be the scope of the condensation on the south side of the Lakes in northwest winds.

Besides the strip of hazardous territory immediately bordering the Lakes another strip is usually found on the western slopes of the Appalachian Highlands in Pennsylvania, and New York. Here the southeastward bound air is again chilled, this time through mechanical raising by the hills. The clouds in such cases form on the hills, obscuring all high ridges, and rendering it necessary to fly through these clouds in order to get over the ridges, and an intensely dangerous condition exists, far worse than may be found over the more level terrain near the Lakes where a small margin between ground and clouds is a safety zone in many instances.

In theory, it may be assumed that the dew point at the ground must be below freezing to permit ice to form on airplanes in the base of the lower clouds over that ground, especially in turbulent conditions. Practically, it is believed that this holds forth some index to dangerous ice conditions, and later it may be possible to advise caution only in areas where ground dew points are below freezing or tending rapidly to attain values below freezing. If there are clouds in the sky under turbulent conditions, their altitude may be calculated by assuming the dry adiabatic lapse rate of temperature corrected for expansion to be in effect and from this reckoning the altitude required to correspond to the difference between dry-bulb temperatures and dew-point temperatures. Both the temperature and altitude of the cloud bases are then available, and these may be referred to surrounding terrain to determine whether clearance may be had over near-by ridges. Another valuable assumption is that the temperature of the base of the clouds will furnish an index so the added altitude necessary to reach temperatures below freezing if this cloud base is above freezing. Such an index is useful in permitting short immersions in clouds to hurdle mountain ridges, if only a short climb is necessary. The lapse rate of temperature for the wet or condensation stage is used. Tabulations of these three sets of factors have just been prepared andtheir trial during the coming winter months is expected to indicate whether they furnish much genuine help to the pilots.

When planes are equipped with readable thermometers and hygrometers, and the meteorologist is armed with many more supporting facts for his few favored assumptions, the question of avoidance will be easier of solution whatever results are obtained by those who labor to develop preventive means. In addition to the two aerographs used last year between Cleveland and Hadley Field, N. J., two more are available this winter, and will be used between those points and between Chicago and Cleveland and Kansas City, and should furnish further light on an interesting and complicated phenomenon.

REFERENCE

(1) "The Problem of Combating Ice Accumulation," by C. G. Andrus, Aviation, Vol. XXIV, No. 16, of April 16, 1928.

NOTES, ABSTRACTS, AND REVIEWS

Henry Joseph Cox, 1863–1930.—In the death of Prof. Henry Joseph Cox at Chicago on January 7, 1930, the Weather Bureau, Department of Agriculture, loses a weather forecaster of wide experience and mature judgment and an executive of rare ability.

Professor Cox was born at Newton, Mass., April 5, 1863, son of Thomas and Hannah Perkins Cox; he attended the primary schools of his native city, was graduated from Harvard University with the A. B. degree in 1884, and received the honorary A. M. degree from Norwich University in 1887, and the degree Sc. D. from the same institution in 1914. He married Mary, daughter of C. C. Cavanagh and Martha Cavanagh in 1887, and is survived by his wife and two sons, Henry Perkins and Arthur Cavanagh; a third son, Paul Greenwood, was killed in action at Soissons, France.

He entered the Weather Bureau (then the Signal Service) on August 1, 1884, and after completing a five months' course in training at Fort Whipple, Va. (now Fort Myer), was assigned to the Chicago station as an assistant observer in January, 1885; in August of the same year he was transferred to the Boston, Mass., station where he served until November 16, 1886; on November 17 of that year he opened the Weather Bureau station at Northfield, Vt., and served as its first official in charge until April 26, 1888; he was then transferred to charge of the New Haven, Conn., station and continued in charge until his appointment as a local forecast official in October, 1894. He was then assigned to the Chicago station, the second time, but now as an assistant to the local forecaster in charge of that station. In 1898, on the creation of the north central forecast district, Cox was placed in charge and he continued in that position until his death; his forecasting activities cover, therefore, a period of 35 consecutive years, 31 of which were as a district forecaster, a record not surpassed by any other Weather Bureau forecaster.

As an official in charge of station, Cox's dominating idea was service to the public—a service that he placed on a very high plane and for which he never had occasion to apologize. His intense loyalty to that service was perhaps the outstanding feature of his administration of the Chicago station. Like many other leaders of men, he inspired his assistants, both by example and precept, to put forth their best efforts. He was an outspoken and an uncompromising enemy of all forms of quackery that by insidious methods sought to creep into the art of weather forecasting.

In his contacts with the general public Cox sought to ally himself with commercial organizations and especially with educational and scientific institutions. While at Northfield, Vt., he inaugurated a course in meteorology in Norwich University, located at that place.

While at Chicago his relations to the Geographic Society of that city were intimate and helpful; in collaboration with Armington, his first assistant, he prepared a monograph on the weather and climate of Chicago (Bull. 4 of the society). He was a past president of the society and the recipient on December 28, 1928, of the Geographic Society of Chicago's gold medal awarded

"For eminent achievement in meteorology and for priceless service in the upbuilding of this society."

As an investigator he will be remembered by his two major studies, the first upon frost and temperatures in the cranberry bogs of Wisconsin and the second on the thermal conditions in western North Carolina as affecting fruit growing in that region.

He was also joint author in the publication Weather Forecasting in the United States, 1916.—*A. J. H.*

Death of Prof. Felix M. Exner.—Under date of February 15, 1930, Dr. E. van Everdingen, president of the International Meteorological Committee, announced to members of that committee the sudden death of Prof. Felix M. Exner, the director of the Austrian Meteorological Service at Vienna. Professor Exner will be kindly remembered by the older members of the Weather Bureau staff as a visitor to the bureau in 1904. An account of that visit may be found in Meteorologische Zeitschrift XXI: 465–68.—*A. J. H.*

Note on the British Isles rainfall predictions [1] (by Dinsmore Alter, University of Kansas, fellow The John Simon Guggenheim Memorial Foundation).—The agreement for the fifth year of these test predictions has been excellent. They called for an unusual drought for the first half year, and that which occurred actually exceeded the predictions. For the second half year they call for almost exactly the normal rainfall, and at the end of November this seems to be the correct result.

For the first half of 1930 they call for a considerable excess.

The correlation between prediction and observation is +0.66 for the five years, with a probable error of about ±0.13; we may begin to feel some confidence that it is not accidental.

The work is at present being repeated with a compilation made from manuscripts in the British Meteorological Office. There will be used 203 years of data instead of 91 of the previous paper; moreover, the record is a better one during the years which the two duplicate. The prediction will be attempted for quarters instead of halves of years.

January, 1930, cyclones and anticyclones.—The outstanding features of the cyclones of the month were their very pronounced instability and their tendency to take the form of a low-pressure trough from which weak secondary depressions would appear and persist for a short time. But a single one of the many cyclones that were plotted on the daily weather maps for the month had sufficient coherence to enable it to cross the continent.

High pressure in the Canadian interior was responsible for the large number of weak cyclones that passed into the Pacific Coast States and dissipated over the Southern Plateau. Anticyclones, on the other hand, moved eastward rather than southeastward as in a normal January. Near the close of the month a great anticyclone with central pressure of 31.10 inches in the Province of Alberta and pressures of 31 inches over southern Idaho rapidly dissipated in two or three days instead of dominating the weather for at least 10 days, as might usually have been expected.—*A. J. H.*

Climate, by C. E. P. Brooks, D. Sc., London, 1929.—In this small volume of 199 pages the author presents a running verbal account of the climates of the earth. The treatment is unique in that the use of graphs and diagrams is nearly avoided, there being but three graphs in the complete work. Appropriate tables of climatic data, one for each of the 23 subdivisions of the six major divisions of the surface of the globe, are presented.

The major subdivisions are as follows:

II. The North Temperate regions (five subdivisions).
III. Mediterranean climates (two subdivisions).
IV. North tropical climates (five subdivisions).
V. Equatorial climates (four subdivisions).
VI. Subtropical and temperate climates of the Southern Hemisphere (four subdivisions).
VII. The polar regions (three subdivisions).

The style of treatment requires great condensation; that the author has successfully reached the goal is evidenced by the 199 pages of type and tables each measuring 6¼ by 3$^{15}/_{16}$ inches.—*A. J. H.*

Sun Spots and the Distribution of Pressure Over Western Europe, [2] *by C. E. P. Brooks, D. Sc.*—Doctor Brooks made an investigation into the relations between the position of any month, quarter or year in the 11-year sun-spot cycle and the distribution of pressure over western Europe and the eastern North Atlantic. Two aspects of the question were considered:

(1) Whether there is any relation between the position of a month in the sun-spot cycle and the type of pressure distribution over the area as a whole.

(2) Whether there is any relation between the position of a quarter or year in the sun-spot cycle and the actual pressure at individual stations.

The results of the investigation as to the first aspect yielded little significant material, and as regards the second I quote the closing sentence of the author's conclusions: "It appears therefore, that at present the variations of sun-spots in the 11-year cycle can not be taken into account in predicting quarterly mean deviations of pressure in the eastern North Atlantic or western Europe."

Flying Over Rough Country in Bad Weather, by Paul A. Miller, Bolling Field.—Fogs, other than the radiation type are generally rare in inland sections during the summer months and are seldom considered to be a factor in flying weather conditions there at those times. However, in one instance known to the writer, a summer fog of the advection type very nearly cost a mail pilot his life.

It was during the latter part of June, 1929, when this occurred. For several days an overcast sky with fog beneath, had persisted from Fairfield, Iowa, southward to beyond Unionville, Mo., on the Chicago-Dallas Airway. This condition was probably due to the fact that an area of high pressure covered the northern Plains States and an area of low pressure covered the southern sections. There is a rise of ground of about 400 feet near and around Unionville and the cool northerly winds out of the high-pressure area were forced upward over this, with consequent formation of fog and low overcast. At other points where the terrain is level these conditions were not apparent.

The northbound mail ship, piloted by James Cleveland, took off from Kansas City for Chicago at about 7 a. m. The pilot was aware that this strip of overcast and fog was present near Unionville, but intended to fly over it, as he knew that Winfield and Moline were clear. He also rather expected that the hot June sun would soon burn this condition out.

However, upon nearing Unionville he decided to try to fly underneath the ceiling, as conditions did not appear as bad as the reports had shown and the ceiling seemed to have a fair clearance over the hills. As he flew along

[1] Presented at the December, 1929, meeting of the American Meteorological Society at Des Moines, Iowa.

[2] Brooks, C. E. P., Sun Spots and the Distribution of Pressure Over Western Europe. Professional Note No. 49 (ninth number in Vol. IV), London, 1928.

under the first part of the overcast he found that the fog was increasing and the visibility decreasing steadily. After about 10 minutes the fog became dense and merged with the ceiling until he could not see the ground from an elevation of 100 feet and had practically no horizontal visibility.

Having flown over this country regularly for a year, he was quite familiar with the terrain and decided to continue at a very low altitude for a few minutes, with the hope that conditions would improve. Instead of improving, the fog became denser, until he was flying blind barely over the treetops. The air became rough and set the compass to spinning and he finally became lost. He decided to land in any field that he could get down in. In a few minutes he had a glimpse of a field that looked suitable, but was past it before he could cut his engine and land. He banked to turn into the field and was flying, so low that the low wing took a large limb off a tree. Then he found that the field was so small that he "couldn't even get his tailskid in it," to use his own words.

He flew around aimlessly for about 15 minutes, after which the air became smoother, and he was able to set a compass course for Moline. He ran out of the fog and overcast within five minutes after finding the course and the rest of his trip was uneventful.

When asked what his reaction was while in the fog, he stated: "I was too busy dodging trees and hilltops to be worried where I would end up, but I believe that I will try to avoid all the blind flying that I can hereafter."

It is believed that the foregoing incident shows how highly important an accurate knowledge of weather conditions ahead is to the pilot, for had he known the exact conditions to be met he would never have attempted to fly underneath the extremely low ceiling present, but would have flown over the top of it, knowing that it was clear to the north.

As a passing thought of comment, pilots are always adverse to flying over the top of bad weather conditions, unless they know the extent of the overcast area. They are apprehensive that they may be drifted off their course by unknown air currents, and later will have to come down through a cloud layer that may be practically on the ground. In this case they would not be aware that they were near the ground until too late to avoid a crash, as the pressure altimeter has a very appreciable lag when ascending or descending.

Meteorological summary for Chile, December, 1929, by J. Bustos Navarrete, Observatorio del Salto, Santiago, Chile.—In December, 1929, there was a slight increase in the intensity of the atmospheric circulation over the Pacific Ocean with an accompanying increase in rainfall in the southern region of the country.

The principal anticyclones were charted as follows: 1st–5th, 9th–10th, and 26th–30th; the principal depressions: 7th–8th, 10th–12th, 18th–20th. The latter storm brought general rains from Aconcagua to Chiloe and much snow on the cordilleras.

In the central zone of Chile the periods of warm weather were marked by only slight intensity.—*Translated by W. W. R.*

BIBLIOGRAPHY

C. FITZHUGH TALMAN, in Charge of Library

RECENT ADDITIONS

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SOLAR OBSERVATIONS

SOLAR RADIATION MEASUREMENTS DURING JANUARY, 1930

By HERBERT H. KIMBALL, Solar Radiation Investigations

For reference to descriptions of instruments and their exposures the reader is referred to this REVIEW, 57:26, January, 1929. Since that date there have been added to the stations for which data are published in Table 2, La Jolla, Calif., latitude 32° 50′ N., longitude 117° 15′ W., altitude 26 meters above sea level; Gainesville, Fla., latitude 29° 39′ N., longitude 82° 21′ W., altitude 71 meters; and Pittsburgh, Pa., latitude 42° 26′ N., longitude 80° 0′ W., altitude 341 meters. The records from La Jolla are furnished by Mr. Burt Richardson, Scripps Institution of Oceanography, University of California, and are made by a Weather Bureau thermoelectric pyrheliometer in connection with an Engelhard recording microammeter. The records from Gainesville are furnished by Mr. Mark D. Butler, College of Engineering, University of Florida, and are made by a Moll thermoelectric pyrheliometer recording on a Richard microammeter. Both of these recording pyrheliometers were standardized at the Weather Bureau observatory, American University, D. C., by comparison with Weather Bureau substandard pyrheliometers, which, in turn, are standardized by comparison with Smithsonian standard instruments. This is true of all the instruments used in obtaining records that are published in Tables 1 and 2. The Weather Bureau station in